

## Chemistry: Scientific Notation

**Part A:** Express each of the following in standard form (no exponents).

1.  $5.2 \times 10^5$  520000

5.  $3.6 \times 10^0$  3.6

2.  $9.65 \times 10^{-4}$  0.000965

6.  $6.452 \times 10^2$  645.2

3.  $8.5 \times 10^{-2}$  0.085

7.  $8.77 \times 10^{-1}$  0.877

4.  $2.71 \times 10^8$  271000000

8.  $6.4 \times 10^{-7}$  0.00000064

**Part B:** Express each of the following in scientific notation.

1. 78,000  $7.8000 \times 10^4$

5. 1.6  $1.6 \times 10^0$

2. 0.00053  $5.3 \times 10^{-4}$

6. 0.0043  $4.3 \times 10^{-3}$

3. 250  $2.50 \times 10^2$

7. 0.875  $8.75 \times 10^{-1}$

4. 2,687  $2.687 \times 10^3$

8. 0.012654  $1.2654 \times 10^{-2}$

**Part C:** Use the exponent function on your calculator (EE or EXP) to compute the following.

1.  $(6.0 \times 10^{23}) + (8.65 \times 10^{24})$

8.  $(7.03 \times 10^{28}) (3.2 \times 10^{-20}) (6.42 \times 10^{35})$

Answer without sigfigs:  $9.25 \times 10^{24}$

Answer without sigfigs:  $1.4442432 \times 10^{43}$

Answer with sigfigs:  $9.3 \times 10^{24}$

Answer with sigfigs:  $1.4 \times 10^{45}$

2.  $(6.02 \times 10^{23}) - (9.63 \times 10^{21})$

9.  $\frac{(-6.02 \times 10^{23}) (-1.4 \times 10^{-15})}{6.54 \times 10^{-6}}$

Answer without sigfigs:  $5.9237 \times 10^{23}$

Answer without sigfigs:  $1.288685015 \times 10^{14}$

Answer with sigfigs:  $5.92 \times 10^{23}$

Answer with sigfigs:  $1.3 \times 10^{14}$

3.  $\frac{5.63 \times 10^{-18}}{8.9 \times 10^8}$

10.  $\frac{(6.02 \times 10^{23}) + (5.8 \times 10^{24})}{8.23 \times 10^5}$

Answer without sigfigs:  $6.3258427 \times 10^{-27}$

Answer without sigfigs:  $7.777885784 \times 10^{18}$

Answer with sigfigs:  $6.3 \times 10^{-27}$

Answer with sigfigs:  $7.8 \times 10^{18}$

4.  $(-4.1 \times 10^{-4}) (7.33 \times 10^{12})$

11.  $\frac{(3.1 \times 10^{-12}) - (4.48 \times 10^{-13})}{6.6 \times 10^{-14}}$

Answer without sigfigs:  $-3.0053 \times 10^9$

Answer without sigfigs:  $4.01818182 \times 10^1$

Answer with sigfigs:  $-3.0 \times 10^9$

Answer with sigfigs:  $4.0 \times 10^1$

# Practice Worksheet for Significant Figures

1. State the number of significant digits in each measurement.

- |               |   |                        |   |                             |   |
|---------------|---|------------------------|---|-----------------------------|---|
| 1) 2800 m     | 2 | 2) 2.84 km             | 3 | 3) 0.005400 m               | 4 |
| 4) 0.003068 m | 4 | 5) $4.6 \times 10^5$ m | 2 | 6) $4.006 \times 10^{-5}$ m | 4 |
| 7) 75000. m   | 5 | 8) 75 m                | 2 | 9) 750 m                    | 2 |
| 10) 75.00 m   | 4 | 11) 75,000.0 m         | 6 | 12) 10. cm                  | 2 |

2. Round the following numbers as indicated:

To four significant figures:

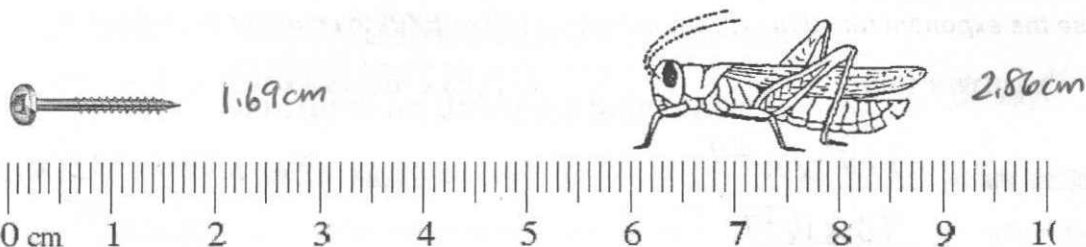
<u>3.682417</u>	<u>21.869051</u>	<u>399.9523</u>	<u>0.0011298</u>	<u>45.4673</u>
3.682	21.87	400.0	0.001130	45.47

To two significant figures:

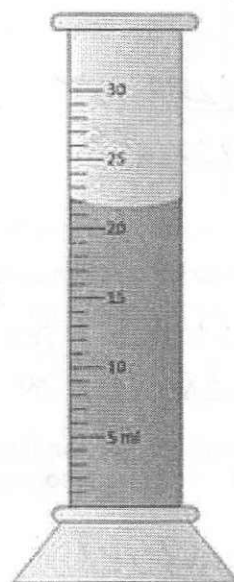
<u>22.694</u>	<u>79.2588</u>	<u>0.03962</u>	<u>103.4125</u>	<u>41.46632</u>
23	79	0.040	$1.0 \times 10^2$	41

Measure the objects below. Record your measurements with the correct number of significant figures based on the instrument used to make the measurement.

(Remember: No Naked Numbers!!!!)



42.6 mL



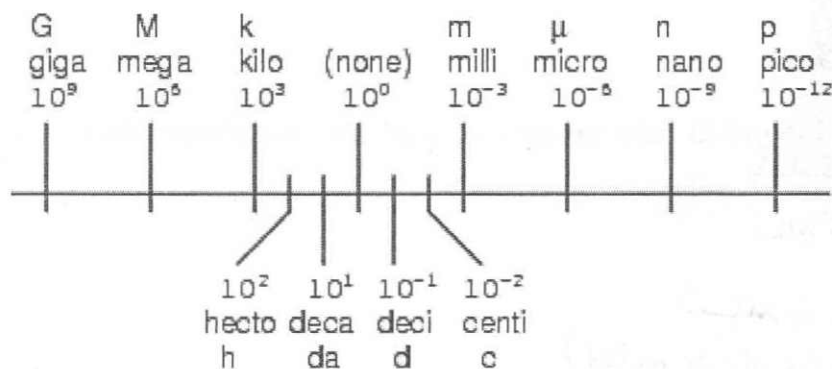
21.5 mL

# METRIC CONVERSION WORKSHEET

Convert the following:

1. 36.52 g = 36520 mg
2. 14.72 kg = 14720000000 ng
3. 0.0035 hm = 3.5 dm
4. 0.134 Gm = 134000 km
5. 25 mm = 2.5 cm
6. 2500 pL = 0.000000002500 L
7. 243L = 24.3 daL
8. 45.23 mL = 0.04523 L
9. 0.035 hL = 350 cL
10. 27.32 mm = 0.02732 m
11. 0.000015 m = 15000 nm
12. 0.023 cm<sup>3</sup> = 0.000023 L
13. 0.00049 Mm = 0.49 km
14. 0.025 kg = 25 g
15. 15 g = 0.15 hg

## METRIC PREFIX SCALE



# Density Problems

- Mercury metal is poured into a graduated cylinder that holds exactly 22.5 mL. The mercury used to fill the cylinder weighs 306.0 g. From this information, calculate the density of mercury.

$$D = X$$

$$M = 306.0g$$

$$V = 22.5mL$$

$$D = \frac{M}{V}$$

$$\frac{306.0g}{22.5mL} =$$

$$13.6 g/mL$$

- What is the weight of the ethanol that exactly fills a 200.0 mL container?  
(The density of ethanol is 0.789 g/mL)

$$D = 0.789g/mL$$

$$M = X$$

$$V = 200.0mL$$

$$D = \frac{M}{V}$$

$$M = DV$$

$$M = \frac{0.789g}{mL} \times 200.0mL =$$

$$158 g$$

- What volume of silver metal will weigh exactly 2500.0 g. The density of silver is 10.5 g/cm<sup>3</sup>

$$D = 10.5g/cm^3$$

$$M = 2500.0g$$

$$V = X$$

$$D = \frac{M}{V}$$

$$V = \frac{M}{D}$$

$$V = 2500.0g \times \frac{cm^3}{10.5g} =$$

$$238 cm^3$$

- A rectangular block of metal weighs 1896 g. The dimensions of the block are 8.4 cm by 5.5 cm by 4.6 cm.

$$1cm^3 = 1mL$$

- From this data, calculate the density of the metal in g/mL?

$$D = X$$

$$M = 1896g$$

$$V = L \times w \times h = 8.4cm \times 5.5cm \times 4.6cm$$

$$D = \frac{M}{V}$$

$$\frac{1896g}{8.4cm \times 5.5cm \times 4.6cm} =$$

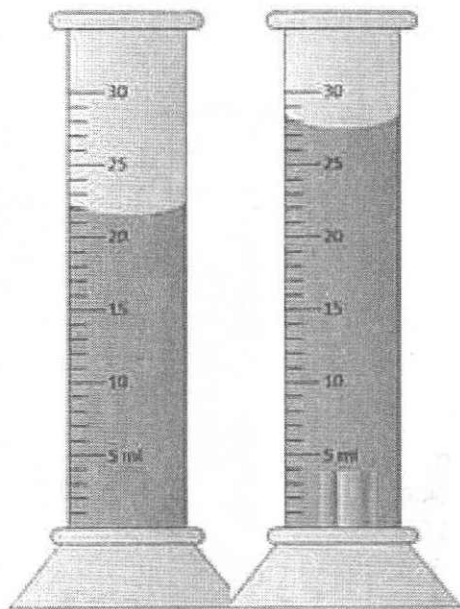
$$8.9g/cm^3$$

$$8.9g/mL$$

- Examine the table below and determine the identity of the metal.

Before rounding for sig figs = Copper

- Examine the picture below to evaluate the volume of a unknown piece of metal that has a mass of the 43.2 g.



21.5 mL

27.5 mL

$$27.5 - 21.5 = 6.0 mL$$

(volume of metal)

- From this data, calculate the density of the metal in g/mL?

$$D = \frac{M}{V}$$

$$\frac{43.2g}{(27.5 - 21.5)}$$

$$= \frac{43.2}{6.0} =$$

$$7.2 g/mL$$

- Examine the table below and determine the identity of the metal.

Chromium

Element	density (g/cm <sup>3</sup> )
Ti	4.50
Cr	7.20
Fe	7.86
Co	8.90
Ni	8.90
Cu	8.92
Zn	7.14